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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/530,981

04/11/2005

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EXAMINER

ZIMMER, MARC S

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/530,981	Applicant(s) HAMADA ET AL.	
	Examiner Marc S. Zimmer	Art Unit 1712	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 August 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 3-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koyama et al., U.S. Patent Application Publication No. 2005/0271922 in view of Kubota et al., WO 98/04598 for the reasons stated previously.

Applicant has furnished for the Examiner's consideration a second declaration where an attempt had been made to make comparable polyether sulfones from synthetic approaches (1) and (2) outlined at the top of column 7 of *Kubota*, the third approach corresponding to that being claimed. There is also described another experiment wherein a polyether sulfone is sulfomethylated by yet a different strategy than is being claimed. The chloromethylated polyether sulfone employed in each trial is said to be that "which is described in the present Example 2." The Examiner can only assume that Applicant is referring to the chloromethylated polyether sulfone mentioned in Example 2 of their Specification. Surely, Applicant appreciates that, for a comparison to be proper, the polymer being sulfomethylated by each of the different processes should be the same in all cases.

As an aside, though never formally stated, it appears that the larger objective of Applicant's response is to illustrate that the particular process being claimed provides

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an unexpectedly superior polymer material with markedly better ion transfer characteristics. A possible alternative inference from the data that Applicant presents is that the other methods simply don't work as a means of sulfoalkylating a polyether sulfone.

Experiment (I) in Applicant's declaration attempts to prepare the sulfomethylated polymer using the first method recited in column 7 of Kubota. Applicant remarks that the NMR spectrum of the product does not contain the peaks expected of a methylene group adjacent to a sulfo group. Rather, they see peaks at 4.6 ppm which they speculate is indicative of methylene protons adjacent a isothiuronium salt. That is to say, there appears to not have been much conversion of the intermediate salt to a sulfonic group. Applicant further remarks that it was not possible to measure the ion exchange behavior of this "product" because the solution to be titrated was clouded and a precipitate appeared as titration proceeded. Though Applicant doesn't say so, it seems evident to the Examiner that the oxidation of the salt to a sulfonic group had not been completed. Indeed, it is significant that, whereas the oxidation step had been carried out in Example 1 of the Kubota reference for six hours, Applicant only mixes the salt intermediate and peroxide for *two hours*. **It is not at all surprising that the product obtained by Applicant when performing this synthesis gave a different NMR spectrum, behaved differently in solution, and yielded a precipitate upon titration because the oxidation of the salt was obviously not complete!**

The Examiner finds the outcome of the second experiment to be rather surprising. In particular, the polymer product isolated after mixing it with hydrogen

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peroxide is not even soluble in N,N-dimethyl formamide [sic]. It is Applicant's contention that the oxidation product would ordinarily be expected to be soluble in this medium and, the fact the obtained product isn't would seem to indicate either (i) no oxidation of the dithiocarbonic acid-O-ethyl ester occurred in which case the "product" is presumably the unreacted starting material, or (ii) the hydrogen peroxide reacted with the backbone thereby creating a new insoluble compound. The second of these possibilities appears not to be likely insofar as Applicant employs the same oxidizing compound in their method. Further, if there were simply no reaction at all and the recovered polymer material is merely the unreacted dithiocarbonic acid-O-ethyl ester derivative of the polymer, it is unclear why it would no longer be soluble in DMF as it clearly was before. Indeed, in Applicant's description of the isolation of the dithiocarbonic acid-O-ethyl ester derivative, the polymer dissolved in DMF is poured into an aqueous medium thereby precipitating the polymer (and removing the potassium bromide by-product, which is soluble in water, from the polymer). Why would the polymer no longer be soluble in DMF if it was not changed in any meaningful way?

As in the first example, the polymer precursor and hydrogen peroxide were only mixed for two hours whereas the reference implies that oxidation was to be carried out for six hours as it had been when converting the isothiuronium salt.

It does appear, on the other hand, that Applicant has faithfully executed the synthesis outlined in the Makromolekulare Chemie reference and did not obtain an equivalent sulfomethylated polymer with good ion exchange properties as one might have predicted. However, the Examiner views this result as inconsequential because

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the Examiner is not relying on this reference as a foundation for rejection nor does Kubota mention this synthetic approach as a means for converting a halogenated polymer to a sulfoalkylated polymer.

The last experiment does, in fact, at least raise the possibility that the strategies disclosed in Kubota cannot be applied to all aromatic polymer materials. However, Applicant must at least exactly replicate the conditions described in the reference. Even in Applicant's own trials in the Specification, oxidation steps were carried out over eight hours.

As an aside, Applicant speculates under the heading of comparative Examples (2) and (3) that the insolubility of the products isolated after mixing with hydrogen peroxide are due to crosslinking reactions facilitated by the high reactivity of the chloromethyl groups. However, this supposition is rooted entirely in conjecture. Further, it should be noted that the reaction conditions under which the chloromethylated polymer is reacted with O-ethyl potassium dithiocarbonate are similar (ambient temperature for 1 hour but in DMF instead of NMP) to those employed in Example 2 of the Specification where the same polymer was reacted with potassium thioacetate. Why would crosslinking be problematic in the conversion to a dithiocarbonic acid-O-ethyl ester but not in the conversion to an acetic thioester under similar conditions?

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For all of the reasons outlined above, the Examiner is not compelled by the new Declaration to withdraw the rejection of record.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marc S. Zimmer whose telephone number is 571-272-1096. The examiner can normally be reached on Monday-Friday 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jim Seidleck can be reached on 571-272-1078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

October 16, 2007


MARC S. ZIMMER
PRIMARY EXAMINER